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THREE NEW SPECIES OF PYCNOGONIDA FROM SAGAMI BAY, JAPAN[1]

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Abstract.—Three new species of Pycnogonida are described from Sagami Bay, Japan; *Ascorhynchus utinomii, Anoplodactylus shimodaensis* and *Anoplodactylus perforatus,* and their relationships to known species in the two genera are discussed. A short resume of pycnogonid literature on Sagami Bay is given.

Introduction

Ohura or Ōura Bay, locally called Nabeta Bay (34°39′30″N, 138°56′40″E), and the immediate vicinity, is the collecting locality for 3 new pycnogonid species. This locality is near Shimoda and is situated on the southwestern side of Sagami Bay, an area that has received substantial coverage in pycnogonid literature. Utinomi (1971), in his summary of known Japanese pycnogonids to that date, listed 32 species as residents of Sagami Bay and he stated (p. 340) that "Sagami Bay and its adjacent waters is . . . the richest of all regional faunae in Japanese waters, as represented by more than 17 genera and 46 species." Fourteen of the species listed are from off Sagami Bay proper, in deeper water.

The early literature on pycnogonids of the area includes Böhm (1879) who described *Ammothea hilgendorfi, Ascorhynchus ramipes* and *Propallene longiceps,* all from Enoshima. Ortmann (1890) described *Anoplodactylus gestiens, Ascorhynchus cryptopygium* and *A. bicornis* (=*A. auchenicum* (Slater)), and listed *Ascorhynchus ramipes* and *Pycnogonum littorale* var. *tenue* (=*P. tenue* (Slater)) from Sagami Bay. Ives (1891) described *Ascorhynchus japonicum* from Japan, listing many collecting localities, one of which was Sagami Bay. Loman (1911) described 4 new species and listed 9 other species from Sagami Bay.

Several other authors, among them Ohshima (1936), listed subsequent records of one or more species from this area. The next significant paper was by Hedgpeth (1949), in his report on Japanese pycnogonids collected by the *Albatross.* He listed 3 new and 3 known species from Sagami Bay (including adjacent Tokyo Bay). Stock (1954) and Utinomi (1959, 1962, 1971) listed and described many additional species from Sagami Bay.

Very little collecting has been done, or at least recorded in the literature, recently for shallow water pycnogonid species in Sagami Bay, but the senior author gathered a large collection of pycnogonids from there as a secondary result of collecting live specimens for purposes of embryological studies. Most of the specimens were taken from shallow water, averaging about 10 meters in depth, in the vicinity of the Shimoda Marine Research Center, the University of Tsukuba (formerly Shimoda Marine Biological Station, Tokyo Kyoiku University). Among the specimens collected were the three new species of pycnogonids described in this paper.

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The types are deposited in the collections of the National Museum of Natural History, Smithsonian Institution, under the catalog numbering system of the United States National Museum, except for several paratypes retained by the senior author to be deposited in Japanese collections.

Pycnogonida
Family Ammotheidae Dohrn, 1881
Ascorhynchus Sars, 1877
Ascorhynchus utinomii, new species
Fig. 1

Types.—Holotype (USNM 184555), male with eggs, coll. Nabeta Bay, 7 to 15 meters, 10 July 1970. Paratypes (USNM 184556), 2 males with eggs, 3 females, same collection as holotype. Paratypes (USNM 184557), 3 males with eggs, 1 male, 3 females, coll. Nabeta Bay, 7 to 15 meters, 13 June 1970. Paratypes (USNM 184558), 3 males with eggs, 3 females, 1 juvenile, coll. Nabeta Bay, 7 to 15 meters, 3 October 1969. Paratypes (KN collection), 1 male with eggs, 2 females, coll. Nabeta Bay, 7 to 15 meters, 8 August 1973.

Description.—Trunk elongate, lateral processes well separated by about their own diameter. Body smooth, without trunk tubercles, but with low rounded tubercle on distal end of all lateral processes. Anterior of cephalic segment without tubercles over chelifore insertion. Ocular tubercle placed over anterior of oviger bases, low, rounded at tip, with 4 large eyes lightly pigmented in alcohol.

Proboscis almost half length of trunk, long and oval with one constriction towards base giving bilobed shape, rounded in cross section.

Abdomen long, reaching almost to tips of second coxae of last pair of legs, swollen distally.

Chelifore scape 1-segmented, longer than third palp segment, glabrous. Chela small with atrophied tiny curved fingers.

Palp 10-segmented, basal 2 segments very small, not longer than wide, third segment longest. Fifth segment with one large seta endally and proximally, several shorter and 2 longer setae distally. Sixth to tenth segments densely setose ventrally, setae subequal in length. Terminal 4 segments long, slender.

Oviger 10-segmented, with tiny terminal claw. Fourth and fifth segments longest, armed with row of lateral setae. Terminal 4 segments with compound spines arranged in 2 or 3 rows, the longest row in the formula 12:9:8:10 for the holotype and 9:8:8:10 for a juvenile.

Legs slender. First coxa with 2 dorsodistal tubercles. Coxa 2 with one low tubercle middorsally. Femur almost as long as combined length of coxae, armed with single dorsodistal seta. Cement glands not found. Tibia 1 the longest segment, armed with few tiny setae dorsally. Tibia 2 about equal in length to femur. Tarsus slightly shorter than propodus, both without ventral setae or spines. Anterior pair of legs with longer tarsus and propodus, armed with extremely tiny terminal claw. Posterior 6 legs with shorter tarsus and propodus having claw almost equal to tarsus length. Male genital pores on posterior 4 legs only. In female, tiny pores without projections ventrally on second coxae of all legs.

Measurements.—(in mm). First trunk segment length, 1.58; total trunk length (to tip 4th lateral processes), 3.46; trunk width (across 2nd lateral processes), 1.92; proboscis length, 1.55; abdomen length, 1.03; third leg, coxa 1, 0.53; coxa

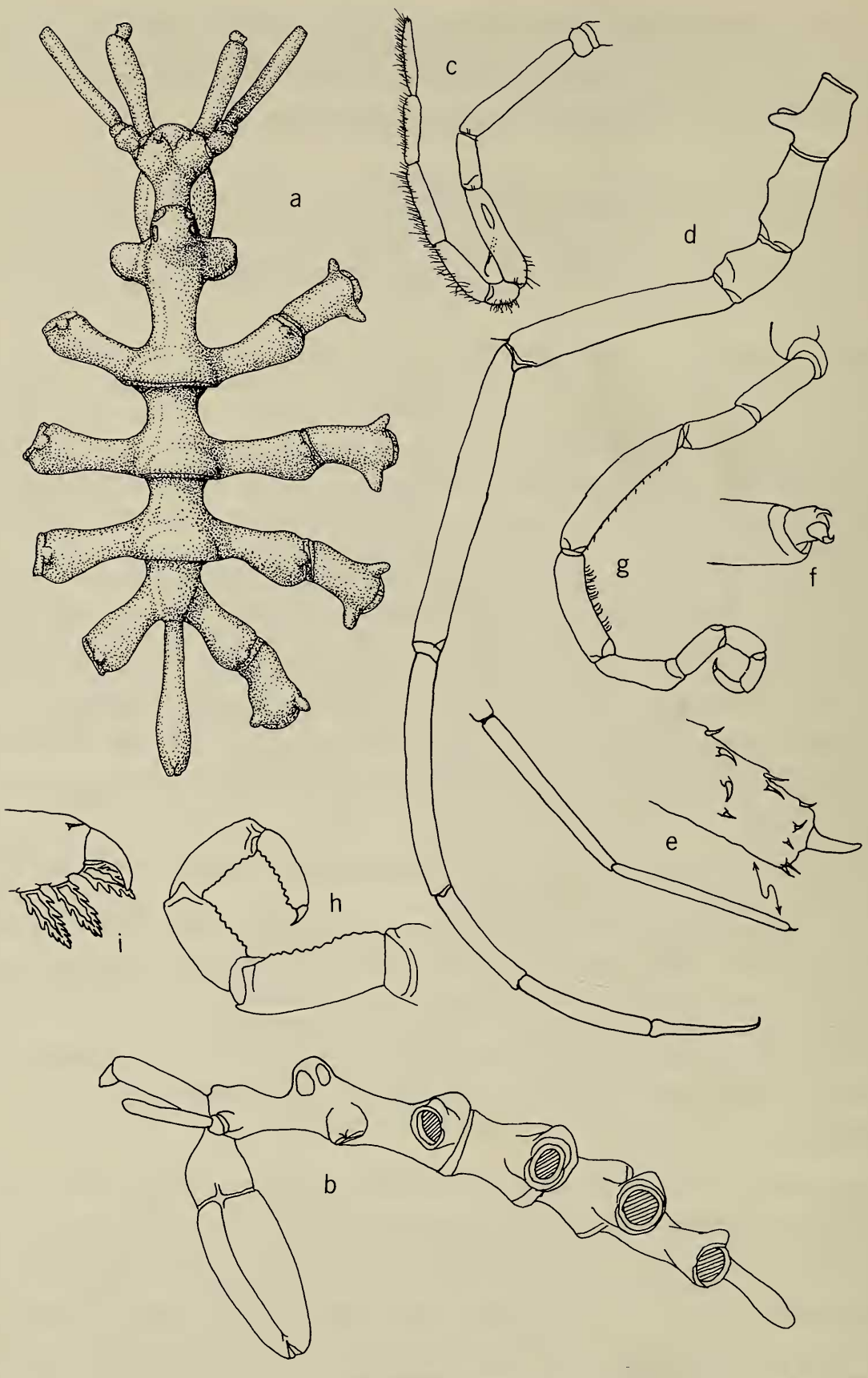

Fig. 1. *Ascorhynchus utinomii,* holotype, male: a, Trunk, dorsal view; b, Trunk, lateral view; c, Palp; d, Third leg; e, Distal segments of first leg with enlargement of tip; f, Distal chelifore, enlarged; g, Oviger; h, Oviger terminal segments, enlarged; i, Oviger tip, further enlarged.

2, 0.59; coxa 3, 0.43; femur, 1.22; tibia 1, 1.78; tibia 2, 1.27; tarsus, 0.66; propodus, 0.76; claw, 0.67.

Distribution.—Known only from the type-locality, Nabeta Bay in Sagami Bay, in depths of from 7 to 15 meters.

Etymology.—This proposed new species is dedicated to the late Dr. Huzio Utinomi, for his many contributions to our understanding of the pycnogonids of Japan. The Japanese compound word "*utinomi,*" translated literally (pronounced oo-chi-nóh-me), means "inside the sea." This compound might in itself prove to be a good name for a new species, but the authors prefer the patronym for this new species.

Remarks.—This species was collected together with *Propallene longiceps* and *Ascorhynchus ramipes,* but in fewer numbers than the others. When living, the proboscis is light yellow in color.

This species is characterized by the shape of the proboscis, the location of the ocular tubercle in relation to oviger implantation, lack of dorsal trunk tubercles, and length of the abdomen. Its body size is almost the same as *Ascorhynchus minutum,* but *A. utinomii* proves to be distinct from *A. minutum* in the following details: the proboscis is bilobed with one constriction in the new species, but is trilobed with 2 constrictions in *A. minutum,* and in cross section, the proboscis is rounded in the new species and not triangular; the ocular tubercle is placed over the anterior of the oviger implantation bulges in *A. utinomii,* but is entirely anterior to the oviger bases in *A. minutum*; median trunk tubercles are absent in *A. utinomii,* but *A. minutum* has small median tubercles; the abdomen is longer in the new species, reaching almost to the tip of the second coxae of the fourth pair of legs, but is shorter and does not reach the distal end of the first coxae in *A. minutum.*

Ascorhynchus utinomii differs from the other small Japanese species such as *A. ramipes* and *A. auchenicum* in its bilobed proboscis and lack of median trunk tubercles. The 2 latter species have a trilobed proboscis and median trunk tubercles of various sizes.

Although the cement glands of this species are not evident, they are probably a row of extremely tiny pores such as those found on some of the larger species of the genus.

Family Phoxichilidiidae Sars, 1891

Anoplodactylus Wilson, 1878

Anoplodactylus shimodaensis, new species

Fig. 2

Types.—Holotype (USNM 184559), male with eggs, coll. Nabeta Bay, 7 to 15 meters, 13 May 1970. Paratypes (USNM 184560), 2 males with eggs, 3 females, same collection as holotype. Paratype (USNM 184561), 1 male with eggs, coll. Nabeta Bay, 7 to 15 meters, 3 October 1969. Paratypes (USNM 184562), 1 male with eggs, 5 females, coll. off Kisami, 30 meters, 22 May 1970. Paratypes (USNM 184563), 3 males, 1 female, coll. Nabeta Bay, 7 to 15 meters, 19 January 1971. Paratypes (KN collection), 3 males with eggs, 2 females, coll. Nabeta Bay, 7 to 15 meters, 5 October 1970.

Description.—Trunk robust, first and second segmentation lines complete. No

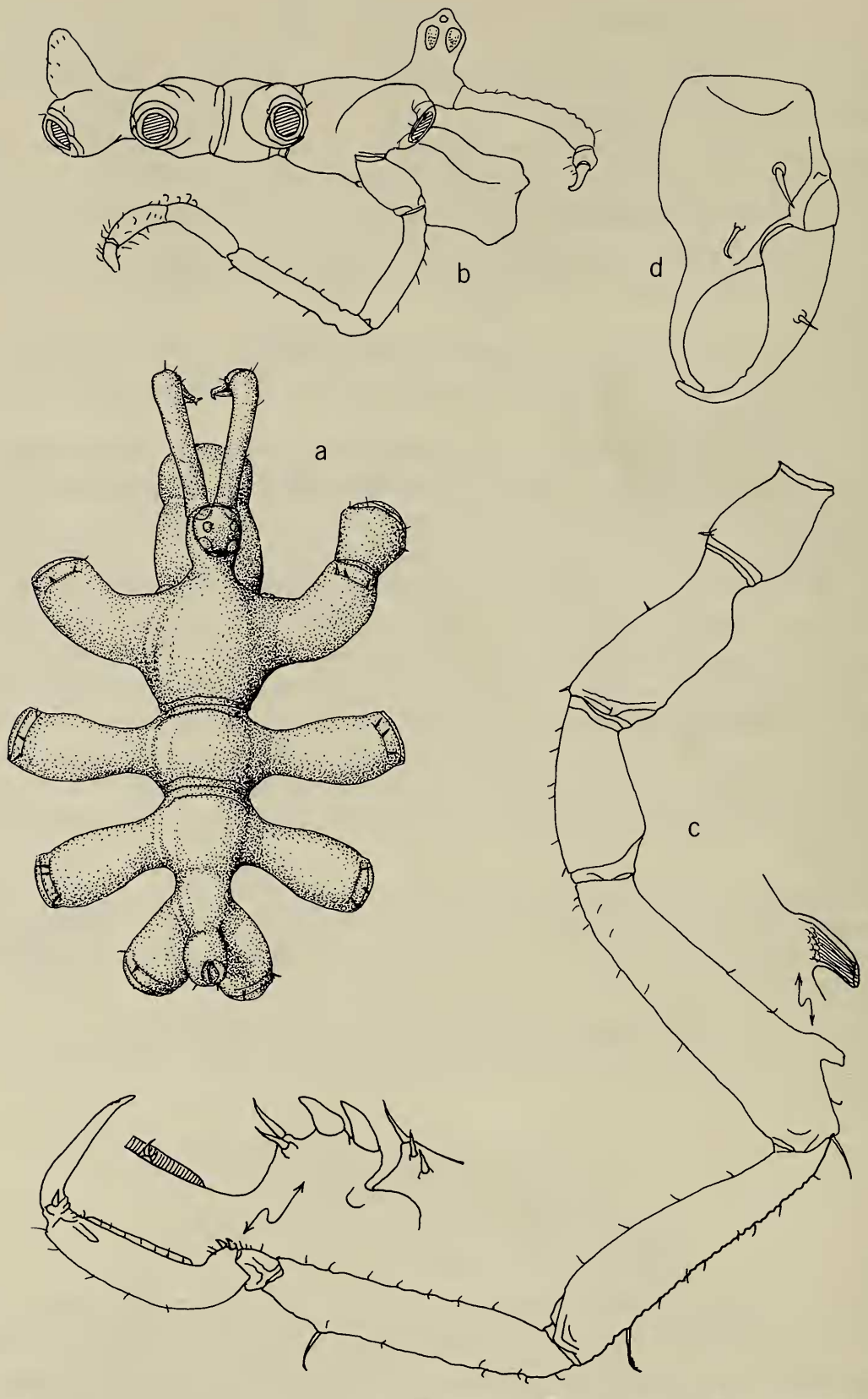

Fig. 2. *Anoplodactylus shimodaensis,* holotype, male: a, Trunk, dorsal view; b, Trunk, lateral view; c, Third leg, with enlargement of cement gland and propodal heel; d, Chela.

segmentation between third and fourth trunk segments. Lateral processes long, over twice as long as their diameters, separated by their diameters or less, without tubercles, armed with 3 or 4 dorsodistal setae. Fourth pair of lateral processes shortest. Neck narrow, ocular tubercle about 1.5 times as tall as width at base, rounded at tip, with low apical cone and 4 large lightly pigmented eyes. Lateral sensory papillae large, prominent.

Proboscis short, robust, blunt at tip with constriction near distal fourth of length.

Abdomen short, erect, approximately as tall as ocular tubercle, tapering to rounded tip, armed with several short setae.

Chelifore scape straight proximally, strongly curved ventrodistally, armed with few setae. Chela small, with curved fingers overlapping at tips. Movable finger with 2 tiny tooth-like bumps, immovable finger without teeth.

Oviger of 6-segments, third with proximal construction. Terminal 2 segments armed with many setae shorter than segment diameter.

Legs moderately long. First coxa with distal setae, second coxa longest. Femur longest of major segments, armed with few setae and a long dorsodistal seta. Cement gland a stout tube shorter than segment diameter, opening dorsally at distal fourth of segment. First and second tibiae almost equal in length, armed with single long dorsodistal seta each. Tarsus short, almost triangular, armed with several ventrodistal setae. Propodus slightly curved, sole straight, with marked heel armed with 2 short stout spines and 2 setae. Sole with propodal lamina over entire length flanked by few short setae. Claw 0.7 propodal length, slender. Auxiliaries tiny.

Measurements.—(in mm). Trunk length (without chelifores), 1.45; trunk width (across 2nd lateral processes), 1.26; proboscis length, 0.59; abdomen length, 0.24; third leg, coxa 1, 0.35; coxa 2, 0.53; coxa 3, 0.44; femur, 0.91; tibia 1, 0.82; tibia 2, 0.79; tarsus, 0.11; propodus, 0.5; claw, 0.36.

Distribution.—Known from the type-locality, Nabeta Bay on Sagami Bay in depths of from 7 to 15 meters. Also found off Kisami in 30 meters.

Etymology.—Named for the town of Shimoda, near where the species was collected. The town of Shimoda was made famous, if fleetingly, as the first place where Commodore Perry landed in 1853, to open diplomatic relations with Japan.

Remarks.—This species is easily distinguishable among Japanese species of *Anoplodactylus* by its small robust size and shape, the short barrel-shaped proboscis with construction, and the wide distally-placed tube of the cement gland in the male. No other known Japanese species in this genus has such robust lateral processes separated from each other by their own diameter, in combination with a short stout proboscis. The single femoral cement glands of this species are placed in a relatively rare distal position. Where the cement gland configuration is known, there are few species in this crowded genus which have the cement gland placed in the distal fourth or even third of the femur. We are unable to find any other known species of the genus from Japan or vicinity with a broad tubular cement gland placed this far forward on the femur.

There are several known species of *Anoplodactylus* with similarities shared by this species, but none of them have the above characters in combination with chela fingers without teeth, no genital spurs on the second coxae of the third and fourth legs, and a moderate length ocular tubercle with conical apex.

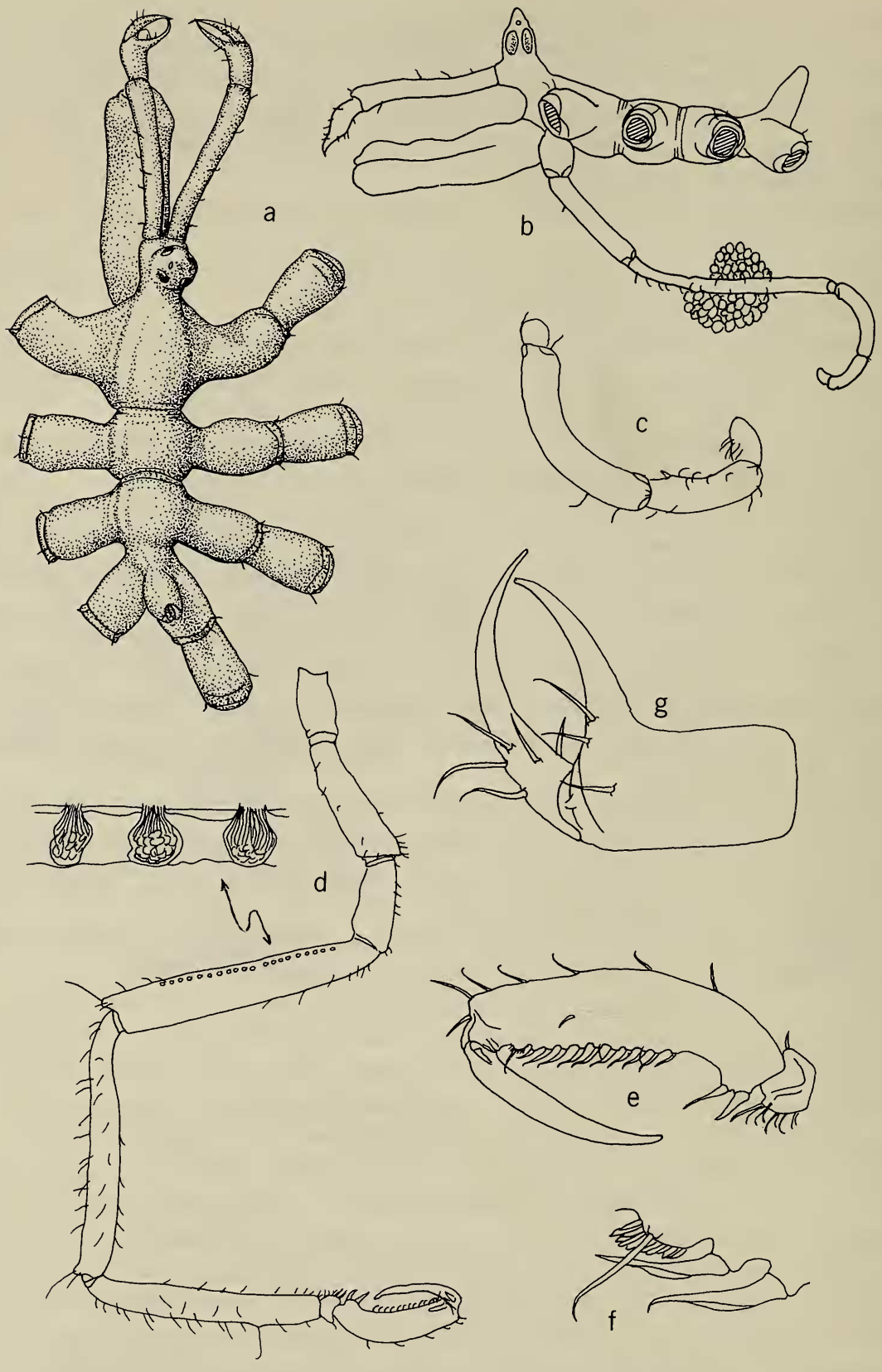

Fig. 3. *Anoplodactylus perforatus,* holotype, male: a, Trunk, dorsal view; b, Trunk, lateral view; c, Terminal segments of oviger, enlarged; d, Third leg, 3 cement glands enlarged; e, Third leg terminal segments; f, Propodal lamina enlarged; g, Chela.

Anoplodactylus perforatus, new species
Fig. 3

Types.—Holotype (USNM 184564), male with eggs, coll. Nabeta Bay, 7 to 15 meters, 3 June 1970. Paratypes (USNM 184565), 1 male with eggs, 2 males, 2 females, 1 juvenile male, same collection as holotype. Paratype (KN collection), 1 male with eggs, coll. Nabeta Bay, 7 to 15 meters, 3 October 1969. Paratype (USNM 184566), 1 male, R/V *Tansei Maru,* cruise KT 69-12, sta. 21, 35°00′54″N, 139°08′36″E, 113 meters, 17 July 1969.

Description.—Trunk elongate, fully segmented between first 3 segments, third and fourth unsegmented. Lateral processes separated by less than their diameters, armed with 2 or 3 dorsodistal setae, without tubercles. Neck short, slender. Ocular tubercle rounded with conical apex, 1.5 times taller than width at base, with 4 large darkly pigmented eyes.

Proboscis slender, blunt at tip, slightly constricted distally.

Abdomen erect, tapering to rounded tip, glabrous, about equal in length to ocular tubercle.

Chelifore scape slender, slightly curved laterally, armed with several dorsal setae. Chela large, palm cylindrical, with 2 or 3 setae. Fingers placed almost at right angles to palm, curved, overlapping at tips, armed laterally and dorsally with several setae, without teeth.

Oviger 6-segmented, long, third segment longest, with proximal constriction. Distal 2 segments armed with many curved setae. Fifth segment armed with single short recurved spine endally.

Legs slender. Coxae armed with several dorsal and ventrodistal setae. Second coxae without genital spur. Femur almost equal in length to tibia 1, both with small dorsodistal tubercle bearing a seta. Femoral cement gland openings dorsal, arranged in single row of cribellate pores numbering 17 to 25 per leg. First tibia slightly longer than second, both armed with many dorsal, lateral and ventral setae shorter than segment diameter and single dorsodistal seta longer than segment diameter. Tarsus short, semitriangular, with several ventral and single dorsal setae. Propodus moderately curved, with marked heel bearing 2 spines. Sole without spines proximally, with about 10 spines and several lateral setae along distal three-quarters of length and very short propodal lamina distally, armed dorsally and laterally with several setae. Terminal claw long, moderately curved, about two-thirds propodal length. Auxiliary claws tiny.

Measurements.—(in mm). Trunk length without chelifores, 1.97; trunk width (across 2nd lateral processes), 1.27; proboscis length, 1.34; abdomen length, 0.37; third leg, coxa 1, 0.47; coxa 2, 0.9; coxa 3, 0.65; femur, 1.68; tibia 1, 1.64; tibia 2, 1.4; tarsus, 0.13; propodus, 0.78; claw, 0.54.

Distribution.—Known from the type-locality, Nabeta Bay in from 7 to 15 meters, and from off Shimoda in 113 meters.

Etymology.—Named for the perforated appearance of the 17 to 25 cement glands along the dorsal surface of the femur.

Remarks.—This species closely resembles *Anoplodactylus gestiens,* except that it is not quite as slender or tenuous and has many cement glands instead of the single gland. A set of figures of *A. gestiens* is included here (Fig. 4) because this species has never, in our opinion, been adequately figured in the literature.

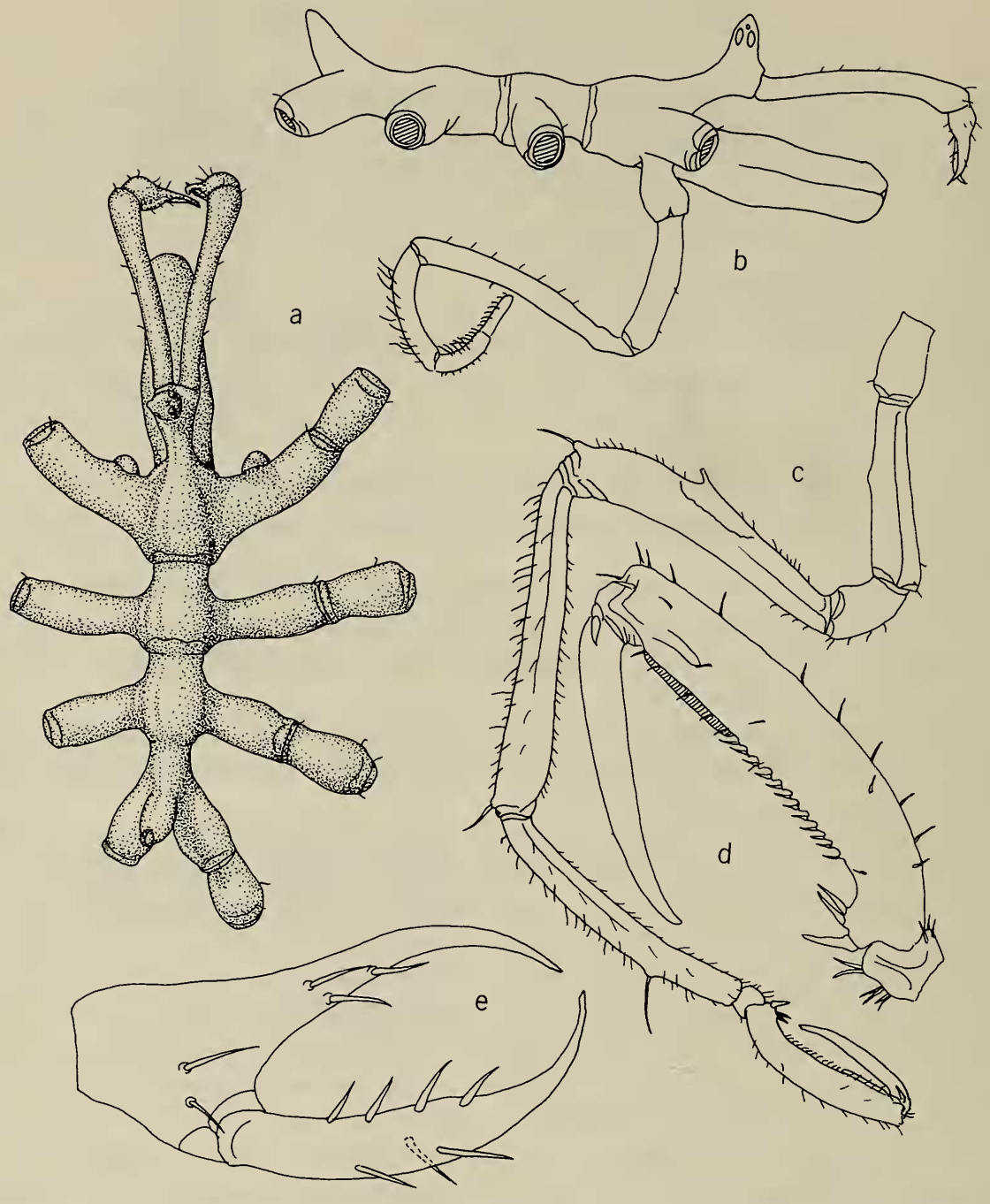

Fig. 4. *Anoplodactylus gestiens,* specimen from TS-69, station 21, male: a, Trunk, dorsal view; b, Trunk, lateral view; c, Third leg; d, Terminal segments of third leg; e, Chela.

There is no known species of *Anoplodactylus* having so many cement glands per femur. The nearest species in number of cement glands is *A. cribellatus* which is reported in the literature to have fifteen or so per leg. All other known species have 10 or less glands per femur. The 14 known species of *Anoplodactylus* with multiple glands are as follows: *A. cribellatus* Carpenter, with about 15 glands; *A. longiformis* Child, with 8 to 10; *A. australis* (Hodgson), about 7; *A. xenus* Stock, about 8; *A. pycnosoma* (Helfer), from 5 to 8; *A. multiclavus* Child, 3 to 5; *A. glandulifer* Stock, 2 to 4; *A. angulatus* (Dohrn), 4 or 5; *A. dentimanus* Stock, 3; *A. oculatus* Carpenter, 5; *A. virescens* (Hodge), 2 or 3; *A. robustus* (Dohrn), 3; *A. longiceps* Stock, 2; and the present new species with from 17 to 25 glands.

There are several species of the closely related genus *Phoxichilidium* which have multiple cement glands on the legs of males.

The proposed new species has no other conspicuous characters to set it apart from many of the genus, but the cement gland number and shape have proved to be sufficiently stable in providing a primary source of differentiation among the many species of *Anoplodactylus*.

Acknowledgments

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